SECTION 23

SEWERS: SANITARY, GRAVITY

23-01 SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, not furnished by the Government, and in performing all operations in connection with the construction of the sanitary sewers, including appurtenant structures and house sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

23-02 APPLICABLE SPECIFICATIONS: The following specifications, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications:

HH-P-117	Packing; Jute, Twisted
QQ-I-652	Iron, Gray; Castings
SS-C-192a	Cements, Portland
SS-P-371	Pipe; Concrete, Non-Pressure, Non-Reinforced and Reinforced

b. [redacted]

STATINTL

23-03 GENERAL: Gravity sewers shall be constructed in conformity with this section of the specifications. Excavation, trenching and backfilling shall conform to the requirements of section on EARTHWORK: GENERAL, of these specifications. Work covered by this section will not be accepted until backfilling connected with the work has been completed satisfactorily. Any section of the sewer that is found defective in material, alinement, grade, or joints before acceptance shall be corrected to the satisfaction of the Contracting Officer.

23-04 MATERIALS:

STATINTL

a. Bituminous joint compound shall conform to the requirements of [redacted] type I, class I.

b. Concrete aggregates shall be as specified in section on CONCRETE, of these specifications.

c. Joint packing shall conform to Federal Specification HH-P-117 except that the material may be jute or hemp fiber. The material shall be dry when used with bituminous joint compound and shall be either

dry or tarred with a suitable grade of pine tar when used with cement mortar joints. The packing shall be square braided or tightly twisted as may be suitable for the type of joint.

d. Pipe shall be concrete pipe. Concrete pipe and fittings shall conform to Federal Specification SS-P-371, bell-and-spigot type. Pipe less than 24 inches in diameter shall be type I, unless otherwise indicated on the drawings or specified.

e. Portland Cement: Portland cement shall conform to the requirements of Federal Specification SS-C-192a, type I.

23-05 COATING: All concrete sanitary sewer pipe including fittings shall be lined.

a. Materials: The corrosion-resistant coating shall consist of coal-tar base materials without any trace of asphalt or petroleum derivatives. The coating shall consist of processed coal-tar pitch, refined coal-tar oils and compatible resins and pigments, and shall be free of all water, benzol and other toxic solvents. The coating shall be air-drying, shall adhere perfectly to concrete and shall be unaffected by the lime or alkalies therein. Coating shall dry hard, in a dense, smooth film free of bubbles or other defects, and shall not soften or sag from the heat of the sun. Coating shall have a consistency that will permit its application at 250 square feet per gallon without running or sagging while wet. It shall be Bitumastic #107 as manufactured by the Kailes Dove-Hermiston Corporation, or approved equal. Material shall be used and handled in strict accordance with the manufacturer's recommendations.

b. Application: Fittings may be coated by dipping, brushing or swabbing, at the Contractor's option. In the event that the coating becomes too thick to dry or drain well, 5 to 15 percent of a thinner approved by the manufacturer of the coating material may be added to reduce the coating material to the proper consistency. The coating shall be so applied as to cover the entire inner surface of the fittings in a continuous coat, free of bare spots and misses. The interior surfaces of all fittings shall be dry and broom-clean before the coating material is applied. Freshly-coated fittings shall be stored in such a manner as to prevent the coating from coming into contact with dirt or foreign materials which may adhere to or damage the coating.

23-06 INSTALLATION:

a. Location: Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet.

b. Crossing above water lines: Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of 10 feet each side of the crossing either shall be cast-iron, steel, or other acceptable pressure pipe and without any joint closer than 3 feet to the crossing, or shall be fully encased in concrete. The thickness of the concrete including that at the pipe joints shall be not less than 4 inches.

c. Pipe Laying: The bottom of the trench shall be shaped to give substantially uniform circumferential support to the lower fourth of each pipe. Pipe laying shall proceed up grade with the spigot ends pointing in the direction of flow. Each pipe shall be laid true to line and grade in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. As the work progresses, the interior of the sewer shall be cleared of all dirt and superfluous materials of every description. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed. If the maximum width of the trench at the top of the pipe, specified in the EARTHWORK: GENERAL, section of these specifications, is exceeded for any other reason than by order of the Contracting Officer, the Contractor shall install at its own expense such concrete cradling, pipe encasement, or other bedding as may be required by the Contracting Officer to support the added load of the backfill. Trenches shall be kept free from water until the pipe jointing material has set and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Contracting Officer so that no trench water, earth, or other substance will enter the pipe or fittings.

d. Jointing: Joints in bell-and-spigot concrete pipe shall be made with class 1 bituminous joint sealer. The sealer shall be heated to the proper temperature to permit rapid pouring and to obtain strong adhesion of the compound to the pipe. The temperature of the molten compound shall be between 350 degrees F and 450 degrees F unless otherwise recommended by the manufacturer. The compound shall not be over-heated or subjected to prolonged heating which might cause a change in its physical properties. Before pouring bituminous sealer, the inside of the bells and outside of the spigots shall be dry and clean before pouring and shall be primed if and as recommended by the manufacturer of the sealer. The joint shall be made as follows: The pipe shall be centered so that the annular space is uniform. The annular space shall then be well-caulked with jute, oakum, or hemp packing that is free from oil and grease. The depth of the packing shall be such as to leave a space, measured from the end of the bell of at least one inch for pipes 15 inches and less in diameter and 1-½ inches for pipes 18 to 24 inches in diameter. When the jointing is made with the pipe in its final location, a suitable joint runner, previously dipped into thick mud or grout to permit easy removal when the joint has cooled, shall be placed around the pipe, leaving an opening at the top of the runner. The molten sealer shall be poured continuously into this opening until the joint is completely filled and shall be poured

as rapidly as possible without entrapping air. After the sealer has cooled or set, the runner may be removed. Alternate joints may be poured before the pipe is lowered into the trench. In this case the joint shall be poured with the pipe in vertical position without the use of the runner. The sealer shall have thoroughly set before the pipe is placed in the trench and the pipe shall be handled so as not to cause deformation of the joint.

c. Infiltration: If, in the opinion of the Contracting Officer, infiltration appears excessive, the amount of leakage shall be measured by a suitable weir as directed by the Contracting Officer and at the Contractor's expense.

23-07 CONCRETE CRADLE AND ENCASEMENT: The pipe shall be supported on a concrete cradle or encased in concrete where indicated on the drawings or required by the Contracting Officer. The concrete shall consist of one part portland cement, 2-½ parts fine aggregate, and 5 parts gravel, with just enough water to produce a workable consistency.

23-08 WYE BRANCHES: Commercially manufactured wye branches shall be installed where sewer connections are indicated on the drawings or where required by the Contracting Officer. Cutting into pipe for connections shall not be done except in special cases approved by the Contracting Officer. When conditions are such that the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, it shall be encased in concrete or supported on a concrete cradle as directed by the Contracting Officer. Concrete required due to conditions resulting from faulty construction methods or negligence of the Contractor shall be installed at the Contractor's expense. The installation of wye branches into an existing sewer of bell-and-spigot pipe shall be made by removing one pipe section, breaking off the upper halves of the bells of the next lower section and of the section to be installed, inserting the new section and rotating it so that the unbroken half of its bell will be at the bottom. The 2 joints shall then be made with joint packing and bituminous joint sealer specified above.

23-09 MANHOLES:

a. General: Manholes shall be constructed of reinforced concrete with cast-iron frames and covers, and in accordance with the drawings. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels may be formed directly in the concrete of the manhole base, or may be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot nor more than 2 inches per foot. Free drop inside the manhole shall not exceed one foot measured from the invert of the inlet pipe to the top of the floor of the manhole outside

the channels, and drop manholes shall be constructed whenever the free drop would otherwise be greater than one foot. Manholes shall be provided with wrought-iron steps not less than 12 inches in width built into and thoroughly anchored in the walls and spaced approximately 15 inches apart as shown on drawings. Bars or rods, when used for steps, shall not be less than 3/4 inch in diameter.

b. Concrete: Except as otherwise indicated on the drawings, concrete and reinforced concrete shall conform to the requirements specified for Class AA concrete under section on CONCRETE, including the requirements for materials, proportions, mixing, placing, protection, curing, and the furnishing and construction of forms. The concrete covering over steel reinforcing shall be not less than one inch for covers and not less than 1-½ inches for walls and flooring, Expansion-joint filler shall be formed of bituminous fiber conforming to A.A.S.H.O. Standard Specification M 59-42.

c. Plastering: Mortar for plastering shall consist of one part portland cement and two parts fine aggregate.

d. Cast-iron frames and covers shall conform to the drawings in all essentials of design. Standard casting differing in non-essential details and approved by the Contracting Officer will be acceptable. The castings shall weigh not less than 400 pounds and shall conform to the requirements of Federal Specification QQ-I-652. The letter "S", at least 2 inches high, shall be stamped or shall be so set that the top of the cover will be flush with or higher than finished grade as directed by the Contracting Officer. All manholes in paved areas shall be provided with heavy type frames and covers as indicated on the drawings.

23-10 CONNECTIONS TO EXISTING MANHOLES: Pipe connections to existing manholes shall be made in such manner that the finished work will conform as nearly as practical to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting and shaping.

23-11 CLEAN-UP: Upon completion of the installation of the sanitary sewers the Contractor shall remove all surplus construction materials and debris resulting from the work.